

REMARKS

Claims 1-25 are present in this application wherein claims 1-13 have been examined and claims 14-25 have been withdrawn from consideration for being directed to a non-elected invention. The Group I invention directed to an apparatus including at least claims 1-13 was provisionally elected with traverse in a telephone conversation. Applicant confirms this election and requests that this restriction requirement be reconsidered and withdrawn. It is respectfully submitted that examination of the group II invention would not be unduly burdensome upon the Examiner and it is therefore respectfully requested that restriction between the Group I and II inventions be reconsidered and withdrawn so that at least claims 14-25 are examined with claims 1-13. Accordingly, reconsideration and allowance for all of the claims in the present application are earnestly solicited in view of the following remarks.

Claims 1-13 stand provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over co-pending U.S. Application Serial No. 10/007,530 in view of U.S. Patent No. 6,020,592 to Liebert et al., U.S. Patent No. 6,182,604 to Goeckner et al., U.S. Patent No. 6,165,367 to Miyake et al., and U.S. Patent No. 5,911,832 to Denholm et al. This rejection is respectfully traversed.

Claim 1 of the present application is directed to a plasma doping apparatus comprising a plasma doping chamber having a process gas source coupled thereto, an anode, a vacuum vessel enclosing the plasma doping chamber to define an outer chamber, a primary vacuum pump connected to the vacuum vessel, a pulse source for applying pulses to the anode, and a controller. The controller establishes a controlled plasma doping environment in the plasma doping chamber in a first mode and establishes a gas connection between the plasma doping chamber and the outer chamber in a second mode. The claimed apparatus has several advantages for improving the operation of the plasma doping system such as shielding vacuum pumping ports and equipment connected to the doping chamber for instance. More specifically, contamination of the wafer caused from sputtering of the chamber walls and reduction of the vacuum pumping components is realized. Also, the surface areas for collecting ions are limited and the load placed on the pulse sources is reduced in the claimed plasma doping apparatus.

Co-pending U.S. application '573 is relied upon to disclose a plasma doping chamber. As noted in this rejection, this co-pending application fails to disclose a pulsed source for

accelerating ions across the plasma sheath, a hollow electrode surrounding the space between the anode and the platen, specific electrical connections for the anode and platen, and implantation of negative ions. Liebert et al. is therefore relied upon to disclose a plasma pulse source for applying high voltage pulses between the platen and the anode and accelerating positive ions across the plasma sheath. Goeckner et al. is relied upon to disclose a plasma doping apparatus which utilizes a hollow cathode. Miyake is relied upon to disclose pulsing and implanting negative ions into a substrate. In addition, Denholm et al. is relied upon to ground a substrate holder and apply pulses to an anode. It is alleged in this rejection that it would have been obvious to combine these documents to provide an implantation with uniformity, low damage and mechanical scanning.

However, assuming that it would have even been obvious to combine these documents, such a combination still fails to suggest or imply a controller as recited in claim 1 of the present application. In particular, the claimed controller establishes a first mode for a controlled plasma doping environment and a second mode for a gas connection between the plasma doping chamber and the outer chamber. As a result, the claimed plasma doping apparatus improves the vacuum operation by shielding vacuum pumping ports and equipment connected to the doping chamber and reducing components. Also, contamination of the wafer caused from sputtering of the chamber walls is reduced. Because none of the cited documents suggest the claimed controller, the combination of documents therefore fails to suggest or imply the plasma doping apparatus as recited in claims 1 of the present application. Accordingly, it is respectfully requested that this provisional obvious-ness type double patenting rejection be reconsidered and withdrawn.


The plasma doping method recited in claims 14-25 of the present application is based upon the plasma doping apparatus recited in claims 1-13 of the present application. A step of controlling the apparatus to establish a first mode for a controlled plasma doping environment and a second mode for a gas connection between the plasma doping chamber and the outer chamber is claimed. For at least the reasons set forth in the rejection above, it is respectfully submitted that claims 14-25 are patentable.

For all of the above stated reasons, it is respectfully submitted that all of the outstanding rejections have been overcome. Therefore, it is requested that claims 1-25 of the present application be passed to issue.

If any issues remain unresolved, the Examiner is requested to telephone the undersigned attorney.

Please charge any additional fees or credit any overpayments to deposit account No. 50-0896.

Respectfully submitted,
Steven R. Walther et al., Applicants

By: 
Mark A. Superko, Reg. No. 34,027
Varian Semiconductor Equipment
Associates, Inc.
35 Dory Rd.
Gloucester, Massachusetts 01930-2297
Telephone: (978) 282-5915

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